Section 102 and 103 Rejections

Applicant respectfully submits that the present claims are allowable over the cited references. Claim 1 recites as follows:

A method for displaying lines on a display device, said method comprising:
   generating a plurality of sample positions in a two-dimensional space;
   determining a sample normal distance for each of the sample positions
   with respect to a line in the two-dimensional space;
   assigning sample values to said sample positions based on the sample
   normal distance of each of said sample positions;
   operating on one or more of said sample values to determine a pixel value;
   transmitting the pixel value to a display device.

The present application is directed toward a system that utilizes supersampling and one or more programmable sample to pixel calculation units for refreshing the display. The graphics processor may generate a plurality of samples (based on a selected set of sample positions) and store the samples into a sample buffer. The graphics processor preferably generates and stores more than one sample for at least a subset of the pixel locations on the display. Each sample-to-pixel calculation unit may be configured to read the samples from the super-sampled sample buffer and filter or convolve the samples into respective output pixels, wherein the output pixels are then provided to refresh the display.

For example, as shown in Figure 17D of the present application, one embodiment of the method described herein may determine sample normal distances for each of the sample positions within the line bounding box 2108 and then assign sample values to these respective sample positions. The sample values for each of these respective sample positions may then be operated on, e.g., filtered, to produce corresponding pixel values as shown in Figure 18. Applicant submits that this operation is not taught or suggested in the Lee reference.

One embodiment of the present application is intended to reduce visual artifacts where filtering may generate undesirable results, for example, when filtering lines or

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other objects that have already been anti-aliased. As the background section of the application notes:

"Line segments drawn using rectangular grids, other than vertical and horizontal lines, typically appear jaggy without anti-aliasing. In order to make these lines appear less jaggy, prior to super-sampling/filtering techniques, anti-aliasing methods were used. However, when filtering is applied to lines that have already been anti-aliased, the lines may appear to be wider beyond a desirable level. Therefore, a method and system are desired to correctly render anti-aliased lines in a super-sampling/filtering environment.

The Lee reference is directed toward a method for anti-aliasing which involves manipulation of <u>pixel values</u>. Thus, unlike the present application, which is directed towards manipulation of <u>sample values</u> prior to operating on the samples to produce respective pixel values, the Lee reference directly manipulates <u>pixel values</u> to perform anti-aliasing.

Lee teaches that Figure 2 shows "a conventional 2 point anti-aliasing method (see column 3 lines 55-56). The conventional method shown in Figure 2 uses the intensity values of the 2 closest pixels PX1 and PX2 and utilizes the equation at column 3 line 61. The Lee patent teaches that "an improvement over the 2 point anti-aliasing method is a conventional 3 point anti-aliasing method" as shown in Figure 3 (see Lee column 4 lines 33-34). The method described in Figure 3 of the Lee patent uses intensity values of 3 pixels shown as PX', PX'' and PX''' to compute the appropriate pixel intensity values for displaying a line.

The invention of Lee is described as a "modified 3 pixel anti-aliasing method." As discussed at column 5 beginning at line 48, the Lee invention evidently determines a value for a variable f (.625) and defines the intensity of the pixel closest to the displayed line as the constant .625 multiplied by the maximum pixel intensity. The Lee patent teaches that its modified 3 pixel anti-aliasing method of the present invention generates outputs in an expedited manner because the number of calculations required is decreased as compared to the conical anti-aliasing method and the conventional 3 pixel anti-aliasing method." (See Lee at column 5 lines 63-67)

Applicant also notes that the Lee patent generally discusses a post filtering or supersampling technique which "takes several samples and computes an average of the

samples to determine each pixels intensity." (See Lee column 1 lines 40-43) However, Lee at most teaches use of a conical filter as shown in Figure 1 and teaches that the number of calculations required "decrease the speed with which an image can be generated for display." (See Lee at column 2 lines 11-17)

Thus, although Lee mentions general supersampling techniques, <u>Lee actually teaches away from using supersampling and filtering in an anti-aliasing method</u>. In contrast, present claim 1 is directed toward a method which operates on sample values, and in particular which determines a sample normal distance for each of the sample positions with respect to a line in a 2 dimensional space and then assigns sample values to the sample positions based on the sample normal distance of each of the sample positions. The Lee patent actually teaches away from the manipulation of sample values in performing anti-aliasing. The limited discussion of supersampling in Lee also does not teach the present claims. For example, present claim 1 recites a method which includes, in part, assigning sample values to sample positions based on the sample normal distance of each of the sample positions, and then operating on the sample values to determine a pixel value. These and other steps of claim 1 are simply not taught or suggested in Lee.

With respect to the assertions made in the Office Action, the Office Action states that Lee teaches "generating a plurality of sample positions" citing column 2 lines 28-40 of Lee. However, this cited portion of Lee merely refers to locating first, second and third pixel values that are closest to a line and calculating pixel intensity values for these pixels, such as multiplying a maximum intensity by a constant value. Thus, this cited portion of Lee has nothing to do with sample positions, but rather is involved with identifying pixels. Pixels are not the same as samples.

With respect to the step of "determining a sample normal distance" the Office Action cites Figure 1 in column 1 lines 65-67 and column 2 lines 1-3 and 28-40 of Lee. The cited portions of Lee at column 1 lines 65-67 and column 2 lines 1-3 is involved with determining pixel intensity proportional to distance. Thus, this section of Lee describes determining the intensity value of a pixel based on the normal distance from the pixel centered to the center of the displayed line. In contrast, this step of claim 1 involves determining a sample normal distance for each of a plurality of <u>sample positions</u>, wherein

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sample values at these respective sample positions may then be filtered or operated on to determine a single pixel value. Thus, Applicant submits that this cited portion of Lee simply does not teach this respective step.

The above cited portion of Lee also does not teach the step of "assigning sample values to said sample positions based on the sample normal distance of each of said sample positions. Rather, as noted above, this cited portion of Lee determines a single pixel intensity value based on its distance from the line. Again, Lee does not teach assigning sample values to a plurality of sample positions based on a sample normal distance, and then operating on these plurality of sample values to determine a single pixel value.

Therefore, Applicant submits that claim 1 and those dependent thereon are allowable. Applicant submits that claim 15 and those dependent thereon are allowable for at least the reasons given above.

CONCLUSION

Applicant submits the application is in condition for allowance, and an early notice to that effect is requested.

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert & Goetzel PC Deposit Account No. 50-1505/5181-30701/JCH.

Also enclosed herewith are the following items:

☒ Return Receipt Postcard

☐ Request for Approval of Drawing Changes

☐ Notice of Change of Address

☐ Check in the amount of $ for fees (   ).

☐ Other:

Respectfully submitted,

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